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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,244	10/24/2003	Takatoshi Tsujimura	CMO.0012US (92096US)	1416
21906	7590	12/06/2006	EXAMINER	
TROP PRUNER & HU, PC 1616 S. VOSS ROAD, SUITE 750 HOUSTON, TX 77057-2631			TUROCY, DAVID P	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 12/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/693,244

Applicant(s)

TSUJIMURA ET AL.

Examiner

David Turocy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,10,12-14,17,18 and 26-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10,12-14,17,18,28 and 31 is/are allowed.
- 6) ☒ Claim(s) 1,3-8,29 and 30 is/are rejected.
- 7) ☒ Claim(s) 26 and 27 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/29/06</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

1. The amendments, filed 9/29/2006, have been considered and reviewed by the examiner. The notes the amendments to claims 30 and 31, therefore the 35 USC 112 1<sup>st</sup> and 2<sup>nd</sup> paragraph rejections to such have been withdrawn. Claims 9 and 11 are cancelled in the amendment. Claims 1, 3-8, 10, 12-14, 17-18, 26-31 are pending in the instant application.
2. The declaration under 37 CFR 1.132 filed 9/29/06 is sufficient to overcome the rejection of claims based upon Nakata et al as set forth in the last Office action. Upon further consideration a new rejection is set forth below.

### ***Response to Arguments***

3. Applicant's arguments filed 4/6/06 have been fully considered but are deemed moot in view of the new grounds of rejection below.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:  

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
5. Claims 29 and 30 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for supplying H<sub>2</sub> and SiH<sub>4</sub> at flow rates that prevent formation of amorphous film, does not reasonably provide enablement for all techniques

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for supplying  $H_2$  and  $SiH_4$  to prevent an amorphous film from forming. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

While the specification clearly enables one of ordinary skill in the art to supplying  $H_2$  and  $SiH_4$  at flow rates that prevent formation of amorphous film, the breadth of the claim is open to a multitude of various other techniques for formation of a layer, each of which would require undue experimentation in determining how to prevent an amorphous film from forming. The nature of the invention deals with chemical vapor deposition, which is highly unpredictable because it deals with the reactions of gases to form film and therefore the prevention of an amorphous film would require undue experimentation. The state of the prior art does not provide additionally evidence to support the claim limitation where supplying  $SiH_4$  and  $H_2$  to prevent the formation of amorphous silicon and depositing microcrystalline after stopping the supply of  $SiH_4$  without undue experimentation as to which supply processes achieve the desired results. Additionally, the specification does not provide additional direction or working examples to one of ordinary skill in the art to provide any other techniques, each of which is within the scope of the claimed invention, to supplying  $H_2$  and  $SiH_4$  to prevent an amorphous film from forming without undue experimentation. While the level of one ordinary skill in the art is high in regards to a chemical vapor deposited film, weighing all of the above factors, the specification does enable one ordinary skill in the art to provide any other techniques, each of which is within the scope of the claimed invention, to

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supplying H<sub>2</sub> and SiH<sub>4</sub> to prevent an amorphous film from forming without undue experimentation

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5686349 by Nakata, hereafter Nakata '349.

Nakata '349 teaches a method of forming a microcrystalline thin film comprising a first process of supplying SiH<sub>4</sub> and H<sub>2</sub> comprising gases into a chamber with a

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substrate, a second process of supplying  $H_2$  alone to the chamber and repeating the first and second process a plurality of times without removing the substrate from the chamber (Abstract, Example 1). Nakata '349 discloses supplying  $H_2$  at a constant rate during both the first and second process and  $SiH_4$  has a first rate during the first process and is not supplied during the second process (Example 1). Nakata '349 discloses repeating the first process and second process to deposit a microcrystalline thin film of desired thickness (Column 5, lines 60-64).

While the examiner notes the process as taught by Nakata '349 does not teach of depositing a portion of the microcrystalline thin film in the second step, it is the examiners position that after stopping the flow of  $SiH_4$ , the process of Nakata '349 inherently results in at least a quantitative amount of continual deposition, during the second step, at which  $H_2$  is maintained at a constant rate, due to the presence of  $SiH_4$  and  $H_2$  remaining in the process chamber. The hydrogen plasma is taught to start immediately after stopping the flow of silane and therefore it is the examiners position that a quantitative amount of time exists prior to exhausting all of the supplied silane through exhaust pipe (5). While, as evidenced by the declaration filed 9/29/2006, the residual silane will deposit as amorphous, the amorphous deposition will in turn be converted to microcrystalline thin film and therefore the process reads on depositing a portion of the overall microcrystalline thin film during the second process.

The examiner notes the claim as written only requires that a portion of the microcrystalline thin film is deposited during the second step and does not require no

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thin film deposition during the first step or that no amorphous thin film is deposited during the second process and then converted to microcrystalline.

Nakata '349 fails to explicitly teach of converting the  $\text{SiH}_4$  to  $\text{SiH}_2$ , which contains a polymer-forming element, by the application of the electric field. However, as evidenced by the admitted state of the art discloses when applying a high-energy electric field to the  $\text{SiH}_4$  is broken down into a more reactive  $\text{SiH}_2$ , which may form a polymer by bonding to each other (Specification Page 3). In addition a flow ratio and an electric field density, which satisfy the relationship as, taught by claim 13, must necessarily result in the formation of the polymer forming  $\text{SiH}_2$ .

Nakata '349 teaches of supplying the gases with a flow rate ratio,  $r$ , equal to 100 and an electric field intensity,  $P$ , of  $1000 \text{ mW/Cm}^2$ , which satisfies the relationship as claimed (Example 1). The hydrogen plasma is taught to start immediately after stopping the flow of silane and therefore it is the examiners position that a quantitative amount of time exists prior to exhausting all of the supplied silane through exhaust pipe (5).

Therefore, the prior art and the present claims, reflected by claim 4, teach all the same process steps and thus the results obtained by applicants process must necessarily be the same as those obtained by the prior art. Therefore by applying an electric field in the chamber with  $\text{SiH}_4$  and  $\text{H}_2$ , with a flow rate ratio and electric intensity satisfying the claimed relationship, it must necessarily result in breaking the  $\text{SiH}_4$  to a third gas  $\text{SiH}_2$ , or activating the source gas to contain an element which forms a polymer due to bonding. Either 1) the applicant and the prior art have different

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definitions of applying an high-intensity electric field, or 2) the applicant is using other process steps or parameters that are not shown in the claims.

While the examiner notes the process as taught by Nakata '349 does not teach of depositing a third gas,  $\text{SiH}_2$ , to a surface of the substrate in the second step, it is the examiners position that after stopping the flow of  $\text{SiH}_4$ , the process of Nakata '349 inherently results in at least a quantitative amount of continual deposition of  $\text{SiH}_2$ , during the second step, at which  $\text{H}_2$  is maintained at a constant rate, due to the presence of a small  $\text{SiH}_4$  and  $\text{H}_2$  remaining in the process chamber for a quantitative amount of time prior to the exhausting of the gases through exhaust path (5).

Claim 8: The prior art and the present claims, reflected by claim 8, teach all the same process steps and thus the results obtained by applicants process must necessarily be the same as those obtained by the prior art. Therefore by supplying the second gas during a portion of the deposition of the third gas, it must necessarily result in reduction of formation of the polymer of the third gas prior to deposition. Either 1) the applicant and the prior art have different definitions of depositing the third gas during the second process without the first process gas, or 2) the applicant is using other process steps or parameters that are not shown in the claims.

***Allowable Subject Matter***

8. Claims 10, 12-14, 17, 18, 28, and 31 are allowed.



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None of the prior art cited or reviewed by the examiner alone or in combination reasonably suggests supplying in a first process  $H_2$  and  $SiH_4$  in a ratio to prevent amorphous deposition and then stopping the  $SiH_4$  to deposit microcrystalline silicon.

9. Claims 26-27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

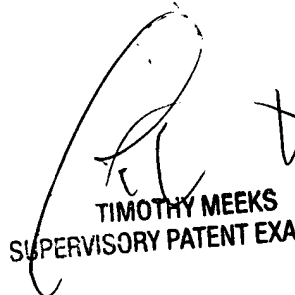
Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

David Turocy  
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TIMOTHY MEEKS  
SUPERVISORY PATENT EXAMINER